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Case Series

Management of Analgesia and One-Lung Ventilation for Thoracoscopic Lung Surgery in Infants

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Abstract

Introduction: Video-Assisted Thoracoscopy (VATS) lung lobectomy has emerged as a minimally invasive approach for pediatric patients requiring lung resection, offering advantages over traditional open surgery. However, effective pain management remains challenging, especially in pediatric patients who are more vulnerable. Enhanced Recovery After Surgery (ERAS) protocols emphasize optimal pain control and rapid discharge as key anesthesiologic goals. Erector Spinae Plane Block (ESPB) has emerged as a promising technique for achieving these aims, yet evidence supporting its efficacy in infants remains limited.

Case Report: We present a case series of 14 infants undergoing thoracoscopic lung lobectomy at our department. To have a good intra and post-operative analgesia a single-shot ultrasound-guided ESPB was performed, along with standard peri-operative care. Intravenous acetaminophen was administered intra-operatively and post-operative, eventually, ibuprofen was prescribed. Pain was assessed using the FLACC scale, and patients were discharged within 48 hours post-surgery.

Analysis: No complications related to ESPB were reported, and patients experienced stable vital signs intra and post-operatively. The pain remained well-controlled without the need for rescue analgesia, and no peri-operative complications occurred.

Discussion: Our findings support the efficacy and safety of ultrasound-guided ESPB for anesthesia and analgesia in VATS lung lobectomy in infants. Compared to alternative regional blocks, ESPB offers simplicity and safety; by targeting somatic discomfort, it facilitates enhanced recovery and early discharge.

Conclusion: Our study demonstrates the successful implementation of ERAS principles with the use of ESPB for peri-operative pain management in pediatric lung lobectomy. While further research is warranted to validate these findings, our case series provides valuable insights and encourages further investigation in this field.

Keywords: Erector Spinae Plane Block (ESPB); Infant lung lobectomy; Video-Assisted Thoracoscopy (VATS); Pain control

Introduction

Video-Assisted Thoracoscopy (VATS) lung lobectomy has emerged as a minimally invasive approach for pediatric patients requiring lung resection [1]. This surgical technique, characterized by small incisions and precise visualization, offers several advantages over traditional open surgery [2].

Certainly, VATS surgery reduces patients' discomfort, but pain management remains a significant challenge, especially in pediatric patients who are for sure more vulnerable and susceptible.

In accordance with Enhanced Recovery After Surgery (ERAS) protocols, ensuring optimal pain control during and after surgery, the least discomfort possible, and a fast discharge are some of the main anesthesiologic aims [3].

The Erector Spinae Plane Block (ESPB) has emerged as a promising technique for achieving these goals, resulting safe also in the pediatric population [4,5]. It is a fascial plane block that involves the spread of Local Anesthetic (LA) between the tip of the transverse process of the thoracic or lumbar vertebra and the anterior fascia of the erector spinae muscles, affecting both the dorsal and ventral rami of the thorax providing extensive analgesia to the thoracic and abdominal regions [6].

Unfortunately, in literature, there are still only a few studies of ESPB that demonstrate its usefulness, with a paucity of evidence supporting benefits also infants.

With our article, we aim to demonstrate and support its efficacy for pain control during and after VATS lobectomy in infants.

Case Report

Description

Our case series is about 14 cases of thoracoscopic lung lobectomy in infants; all patients were ASA class II and the surgery was performed in our women and children's hospital F. Del Ponte, in Varese in 2023.

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The first choice for pain management was a single-shot ultrasound-guided (US) ESPB.

Anesthesia was induced with sevoflurane, was placed a peripheral intravenous catheter, and was administered fentanyl (1mcg/kg) and rocuronium (0.6 mg/kg).

Tracheal intubation was done differently depending on the lung surgically involved:

- Left lung exclusion: oral-tracheal intubation (OTI) was performed and then was placed a left extra-luminal endobronchial blocker under fiberoptic vision
- Right lung exclusion: OTI and then the same tube was inserted through the left bronchus under fiberoptic vision

Intravenous (IV) acetaminophen (7.5 mg/kg for weight <10kg and 15 mg/kg for weight ≥10kg) was administered intraoperatively.

After OTI the little patient was positioned on one side and us-ESPB was performed sterilely at T4 level (same side of surgery) with 4-10 mL of 0.2-0.25% levobupivacaine.

The maintenance of anesthesia was guaranteed by sevoflurane (MAC 0.8).

Standard parameters -such as pulse oximeter saturation (SpO2), blood pressure, heart rate, end-tidal CO2, and capnography curvewere monitored throughout the procedure.

All the patients were awakened and extubated in the operating theatre and after 1 hour of observation in the Recovery Room they were sent to the ward.

Acetaminophen IV (same dosage used intra-operative) was prescribed every eight hours for the first 24 hours post-surgery; a rescue analgesic dose of ibuprofen IV (10mg/kg) was prescribed a maximum of three times per day.

Pain was monitored every six hours using the Face, Legs, Activity, Cry, and Consolability (FLACC) scale.

The chest drain tube was removed on the first post-operative day.

Discharges were made 48 hours after surgery without any complications reported.

Analysis

There were 7 cases of left lobectomy with a mean age of 6.72 months and 7 cases of right lobectomy with a mean age of 7.29 months, the global mean age was 7 months.

No complications during US-ESPB procedure were reported; all the monitored parameters remained stable and in acceptable range for age and weight intra and post-operative.

During the ward stay pain was never reported >4 using the FLACC scale, with no need for rescue analgesic drugs, and no peri-operative complications emerged.

Discussion

According to our findings, US-ESPB was a valid and great choice for anesthesia and analgesia in VATS lung lobectomies in infants.

If compared to epidural or paravertebral block, it is easier and faster to perform and does not have the risks of a central block and the us-guided technique ensures high safety [7,8].

In this surgery the discomfort is mostly somatic due to trocars and eventual intercostal drain tubes and a fascial plane block seemed to be a good strategy to reduce pain, enhance recovery, and make a quick discharge [9].

The two different choices for OTI were guided by the attempt to maintain the superior right bronchus patent.

Conclusion

In conclusion, we can affirm that all our goals mentioned at the beginning of the study, according to ERAS protocol, were fully achieved.

ESPB has proven to be a safe and effective strategy for peri-operative pain control, reducing the need for IV medications and alleviating discomfort in pediatric patients. While larger, possibly multicenter studies are warranted to further substantiate these findings, we hope that our case series catalyzes additional research in this area.

Author Contributions

Andrea Luigi Ambrosoli planned the presented study and supervised the work. Silvia Agrati contributed to the design and implementation of theresearch, to the analysis of the results and to the writing of the manuscript. All authors discussed the results and contributed to the finalmanuscript.

Conflict of Interest and Grant Information

All the authors declare no conflict of interests. The authors received no specific fundingfor this work.

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